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UNITED STATES

**AGENCY FOR INTERNATIONAL DEVELOPMENT**

**Report on Best Candidate Projects**

**Energy Efficiency Projects Selection  
Technical Assistance**

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# Executive Summary

The Electrotek team has examined opportunities for feasible energy efficiency projects and analyzed technical, financial and institutional information, which was collected in the following seventeen visited cities: Targoviste, Campina, Slobozia, Mioveni, Botosani, Piatra Neamt, Reghin, Campia Turzii, Urziceni, Braila, Tulcea, Medgidia, Arad, Deva, Alba Iulia, Sebes, and Brasov. The municipalities of all cities mentioned above expressed an initial interest in the development debt/equity project financing under commercial terms and conditions and informed the Romanian Agency for Energy Conservation (ARCE) about their intentions.

The Electrotek team has examined technical, financial and institutional information presented by representatives of municipalities and the respective district heating companies (DHC). This information is the responsibility of municipality's and DHC's management. It is important to note that financial statements of all DHCs had some inconsistencies. All initial conclusions on the company's financial performance presented in this report should be considered as preliminary only.

Due to the commercial focus of this project, the Electrotek team concentrated principally on the initial assessment of the viability of proposed projects and financial performance of municipalities and DHCs. The assessment was based on a number of parameters in three major subcategories that are briefly described below:

## **1) Economic outlook for the municipality securing the loan, creditworthiness of its budget and validity of its guarantee**

- a) *Business activity trends* - as an indicator of the local economic situation (judged for major area enterprises by the dynamics over several recent years of employment or production in physical units);
- b) *Diversity* of the industries and businesses active in the area (or, contrary, the domination of the municipality by a single major employer) – as an indicator of economic risk for the municipality;
- c) *Unemployment rate* – as a general indicator of the local economic situation;
- d) *Budget per capita in hard currency* – as a general indicator of a relative burden that the debt service for a considered loan would put on the municipal budget;
- e) *Structure of the municipal budget, in particular percentage of direct revenues and percentage of state and county subsidies* in the total revenues of the municipal budget – as indicators of budget risk. From the point of view of budget risk, there are three major revenue streams that form a municipal budget according to Romanian legal framework. In the order of increasing risk, they are 1) direct revenues; 2) revenues from the state budget; 3) subsidies. Direct revenues include property taxes from individuals and entities, other local levies and taxes, rent from municipal buildings and land, income from subordinated Autonomous Regies, sponsorships and donations, etc. Revenue from the state budget represents the municipal share in the wage and income taxes from the local economic activity collected by financial administrations (local branches subordinated to the national Ministry of Finance). The amount of this revenue is prescribed by the law, and its collection, according to the municipalities, has recently improved, but it still may be subject to delays or contingent on the solvency of the state budget. Finally, subsidies

(both on the state and county level) are the most risky part of the municipal budget since they depend on a number of financial and political factors, many of which are beyond the municipality control;

- f) *Credit history of the municipality* (especially, instances of late payments of installments or loan default) – as an indicator of credit risk;
- g) *The degree of municipality commitment* to working with the Electrotek team in applying for the loan, and developing and implementing the project;

## **2) Technical and financial performance of the district heating company and its institutional and human capacity to implement a project**

- a) *Heat tariff* – as a partial indicator of the district heating system efficiency (together with the price of purchased fuel and heat);
- b) *Share of fuel cost in total production cost* – as another partial indicator of the district heating system efficiency (together with the percentage of own heat generation);
- c) *Net income* as compared to total revenues – as a general indicator of economic performance by the district heating company, and *profit margin ratio*, which measures the percentage of each revenue in Romanian lei (ROL) that results in net income (profit margin = net income/revenues). In this report, this ratio is mainly used as a measure of non-loss activity, taking into account the current status of DHCs in Romania;
- d) *Annual revenues on an accrual basis* – as an indicator of the scale of business operations for the utility;
- e) *Collected revenues* as compared to accrual revenues and the dynamics of *account receivables* over the last several years – as indicators of non-payment risk at the current moment on in the near future;
- f) *Current ratio*, which expresses the relationship of current assets and current liabilities (current ratio = current assets/current liabilities). Current assets include receivables, cash, inventories, prepared expense and deferred charges, and marketable securities. Current liabilities include payables, taxes payable, debt due within one year, and other current liabilities. The current ratio is widely used as a broad indicator of a company's liquidity and short-term debt-paying ability;
- g) *Timeliness of payments* by population and economic entities – as another indicator of non-payment risk;
- h) *Subsidies for heat* as the percentage of total revenues – as an indicator of the utility dependency on the state of the municipal budget;
- i) *Borrowing experience* of the utility – as an indicator of credit risk;
- j) *Technical competence* of the utility management and staff as evaluated by the members of the Electrotek team;
- k) *Institutional, organizational and human capacity* of the utility management and staff to implement a project as evaluated by the members of the Electrotek team;
- l) *Utility commitment* to work with the Electrotek team in implementing the project.

## **3) Viability of a potential project**

- a) *Anticipated return on investment* (estimated by the Electrotek team) – as a general indicator of the project financial viability. Since in most cases there was no prepared project proposal that would fit within an affordable loan amount, it was impossible to calculate payback period, internal rate of return and net present value for a potential project. Instead, the Electrotek team performed an informal qualitative assessment of the

potential project based on general technical and economic parameters of the current and proposed technologies, level of heat tariff, fuel prices, scope of the project, etc;

- b) *Size of the project* (measured by the amount of an affordable loan in hard currency) – as an indicator of potential interest and requirements to the project from different lenders;
- c) *Objective need* of the locality in the project – as an additional indicator of the local partner's commitment to see the project implementation through;
- d) *Existence of the preliminary collected data, studies, proposals and analyses* that could be used for project selection and development, or business plan preparation.

The above parameters included both quantitative and qualitative indicators; the latter were sometimes objective but mostly based on the impressions and opinions of visiting Electrotek team members. The constraints of time and budget prevented the team from obtaining each and every parameter for each and every locality. Moreover, if taken out of context, most of the parameters can be signs of different, sometimes opposite, trends (i.e., a budget surplus can attest to good fiscal discipline of the municipality or, conversely, indicate its inability to timely implement already funded projects). As another example, a low profit margin for a regulated utility can indicate a poor performance or, on the other hand, reveal the financial dexterity of its management trying to protect the utility tariff from cuts by regulators). Therefore, neither a single parameter, nor a fixed combination of parameters, could be used as the universal measure-of-merit for comparing localities and/or projects against each other. The ranking of localities and projects by the Electrotek team is given in the table below.

\* Note: From December 31, 1999 to June 30, 2000 the current ratio of the DHC in Urziceni dropped from 1.94 to 0.45.

Rating	City	Municipality			D H C			Project		
		as of December 31, 1999			as of December 31, 1999			Objectiv e Need	Return on Investment	Anticipated
		Budget	Subsidies	Estimated	Total	Profit	Current			
		(US\$)	per Capita	as % of Budget	Affordable Debts	Revenues	Margin	ratio		
			(US\$)	(%)	(US\$)	(US\$)	(%)			
1	Medgidia	\$2,581,653	\$52	10.2%	\$1,000,000	\$1,960,960	0.2%	1.18	Urgent	High
2-3	Arad	\$11,297,392	\$56	2.9%	\$8,000,000	\$10,559,483	0.2%	0.82	Average	Average
2-3	Piatra Neamt	\$5,378,471	\$43	11.1%	\$3,500,000	\$6,561,013	0.6%	1.13	Average	Average
4-5	Tulcea	\$4,523,775	\$46	7.5%	\$2,500,000	\$2,314,851	-5.0%	0.97	Urgent	High
4-5	Campina	\$2,620,733	\$62	1.0%	\$1,500,000	\$1,660,037	-0.8%	1.11	Average	High
6	Alba Iulia	\$4,033,324	\$54	8.2%	\$2,000,000	\$147,718	-14.3%	N/A	Urgent	High
7	Targoviste	\$5,378,475	\$54	16.3%	\$4,000,000	\$3,829,755	-4.6%	0.41	Question.	Average
8	Slobozia	\$2,869,006	\$50	8.5%	\$1,500,000	\$3,139,963	0.4%	0.67	Urgent	Average
9	Urziceni	\$826,702	\$44	0.1%	\$500,000	\$357,214	10.9%	1.94*	Urgent	Low
10	Campia Turzi	\$887,418	\$29	5.0%	\$500,000	\$1,188,024	2.0%	1.43	Question.	Average

# Project Review

## Medgidia

Medgidia is a small city, but it is the second within Constanta County in term of its population. Its economy is mainly based on agriculture, mining and production of construction materials. After a steep decline in previous years, economic activities appear to have stabilized. Main enterprises are privatized, often with participation of foreign capital, like a major cement plant that is now owned by a French company “Lafarge” and in full operation. A number of food-related industries, wineries, two alcohol beverage factories and smaller businesses are also active. In addition, the city has a busy harbor.

Population	50,100
Unemployment rate	19%
Local economic outlook	Very good
Commitment of the municipality	Very good
<b>Affordable debt financing</b>	<b>\$1,000,000</b>

The reported level of unemployment is quite high but the city doesn’t look to be in bad shape. The roads are well maintained, and recently a street lighting project was implemented. One possible explanation to this discrepancy is the presence of fertile agricultural land around the city and mild marine climate. There are many gardens around and about 1700 hectare of grape arbors that provide income for the population.

## Municipality

Municipal management appears experienced, competent and popular (the city mayor and vice-mayor have held their positions from the beginning of the nineties, being re-elected twice). The municipality invested money into the construction of a gas pipeline to the city; investments were also made into water supply and sewage systems. Although in 1999 only the budget per capita exceeded the average level, after nine months of 2000 budget surplus and subsidy's indicators were substantially better than their averages.

	<b>31-Dec 1999</b>	<b>30-Sep 2000</b>
Budget size	\$2,581,653	\$2,132,034
Budget per capita	\$52	\$43
Budget surplus	0.6%	4.3%
Subsidies as % of budget	10.2%	3.9%

## District Heating Company

The municipal company, SC Edilmed SA, operates the heating system, water supply and sewage systems, as well as urban waste collection. This is a joint stock company that is fully owned by the municipality. It does not have a Board of Directors and is run by an administrator that the Local Council appoints for 4 years based on the results of an open contest. District heating infrastructure belongs to the municipality.

Cost of heat production, ROL/Gcal	842,882
Number of employees	450
Commitment of the DHC	Very good

It is important to note that after six months of 2000 receivables in the local currency were less than at the end of 1999. Additionally, the current ratio increased from 0.99 on December 31, 1998 to 1.22 on June 30, 2000, which shows a growth of the company's short-term debt-paying ability. The current liabilities include outstanding principal in the amount of ROL 500 million.

	31-Dec 1998	31-Dec 1999	30-Jun 2000
Operating revenues from heating activity excluding subsidies	\$959,836	\$604,590	No data
Operating revenues from heating activity including subsidies	\$1,342,492	\$1,088,367	No data
Total revenues	\$1,342,492	\$1,960,960	\$1,434,919
Profit margin	0.4%	0.2%	0.1%
Current ratio	0.99	1.18	1.22

The same municipal company is in charge of the heating system, water supply and sewage systems, and urban waste collection. Heat for the municipal system is generated at 18 boiler houses (BH), which feed 18 isolated systems. Around 50% of city population residing at 6600 apartments of 174 apartment buildings is served by the municipal district heating system (DHS). Currently no heat is purchased from outside sources.

The main problems for the heating system are:

- Low efficiency due to aged and obsolete equipment,
- High heat and water losses,
- High cost of generated energy, primarily due to very expensive liquid fuel utilized by all boilers. (The reported cost of the fuel is ROL 9,000,000/ton or US\$ 380/ton.



1.	Served by DH, '000 residents	26.4
2.	Duration of heating season	180
3.	Average temperature of heating season, °C	2.3
4.	Total heated floor area, m <sup>2</sup>	272,011
5.	Total installed capacity of heat sources, Gcal/h	59.9
6.	Reported total heat demand, Gcal/h	32.6
7.	Annual heat supply by DH company, Gcal/yr	57,570
	Including: heat purchase from outside, Gcal/yr	None
8.	Fuel purchase by DH: Natural gas, '000 m <sup>3</sup>	N/A
	Liquid oil, ton	7630
9.	Fuel cost: Gas, \$US/'000 m <sup>3</sup>	N/A
	Oil, \$US/ton	380

## Project proposals of the city

Although the municipality and district heating company (DHC) had limited financial resources for capital investments, 5 of 18 BHs were upgraded with the new equipment. The municipality and DHC suggested in their proposals improvement of three additional isolated systems: BH # 1, 4 and 7 including replacement of boilers with all auxiliary equipment, adjustment of piping, and installation of controls. Proposals assumed that natural gas would be available for the next heating season.

A possible least-cost alternative, the implementation of heat pumps that will utilize waste heat discharged from the nuclear plant Chernovody, should be investigated. The cooling water channel from the plant passes about 1 km from the city.

The main benefits of the proposed project include:

- Anticipated short payback period,
- High potential for replication,
- Step-by-step implementation, which requires only a small upfront investment.

## **Arad**

Arad is a relatively big city (the largest of the ten under consideration) with a diverse and active economy. Local enterprises produce heavy machinery and equipment, textiles, and plastics. There are numerous food processing industries, including a meat processing factory. Unemployment is the lowest of the cities visited and well below the average for Romania.

Population	200,000
Unemployment rate	7%
Local economic outlook	Very good
Commitment of the municipality	Very good
<b>Affordable debt financing</b>	<b>\$8,000,000</b>

## **Municipality**

The budget of 1999 looks relatively good in comparison with other cities. In 1999 the budget per capita exceeded the average by 13%, while subsidies were below 3%, which was three times less than the average level (although in the plan for 2000 subsidies jump up to 11% of the budget). The financial management of the municipality seems to be quite professional and competent.

	<b>31-Dec 1999</b>	<b>31-Dec 2000 (plan)</b>
Budget size	\$11,297,392	\$11,494,958
Budget per capita	\$56	\$57
Budget surplus	\$178,202	\$0
Subsidies as % of budget	2.9%	11.0%

## **District Heating Company**

The Arad district heating company, SC Arterm SA, is a commercial (joint-stock) company that was registered in 1995. Of its equity, 85.9% is owned by the municipality and 12.26% belongs to the county council. The remaining 1.84% belongs to employees and different other companies. Arterm operates under a concession agreement with the municipality that was signed in 1995 and expires in 2005. The company Board of Directors consists of five people, three of whom are also the members of the Municipal council. Arterm owns 45 central heating substations (CHSS) of the district heating (DH) system. The municipality owns 170 kilometers (km) of secondary distribution pipelines.

Cost of purchased heat	
Households, ROL/Gcal	298,370
Business Entities, ROL/Gcal	309,562
Cost of heat distribution, ROL/Gcal	136,350
Number of employees	419
Commitment of the DHC	Excellent

Although the company did not have losses in 1998 and 1999 and after 9 months of 2000 demonstrated the growth of the profit margin, there is some concern about the financial performance of the company. Since 1998 the current ratio has not been exceeding 85%, and in addition in 2000 from January to June receivables increased by 61% and 26% in Romanian lei (ROL) and US dollar (US\$) equivalent, respectively. This trend directly contradicts verbal statements about accounts receivable being equal to the last month bills and the absence of debts to the company older than one month that DHC management made during interviews with the members of Electrotek team. Unless more detailed data are obtained, the final judgment on the financial performance of Arterm must be withheld.

	<b>31-Dec 1998</b>	<b>31-Dec 1999</b>	<b>30-Sep 2000</b>
Operating revenues excluding subsidies	\$8,233,044	\$7,676,444	No data
Total operating revenues including subsidies	\$10,444,728	\$10,559,483	\$5,766,539
Profit margin	1.1%	0.2%	2.7%
Current ratio	0.85	0.82	0.85

Arterm delivers to customers heat, which is produced by the combined heat and power plant (CHP) located 4 km from the city's border. The CHP, which belongs to Termoelectrica (formerly CONEL), provides heat to 1850 residential buildings (32,000 apartments). The equipment of the CHP plant is oversized several times against the municipal heat demand. Two of Termoelectrica's pipelines connect the CHP with 47 central heating substations (CHSS) located within residential zones.

The heating system of city is relatively well equipped with heat meters. Heat meters are installed in the distribution network before and after each CHSS, at user sites in apartment buildings, and even in some apartments. The main problems with the existing municipal heating system are related to high heat and water losses within the distribution system.

1.	Served by DH, '000 residents	95
2.	Duration of heating season	180
3.	Average temperature of heating season, °C	Unknown
4.	Total heated floor area, m <sup>2</sup>	3,071,827
5.	Total installed capacity of heat sources, Gcal/h	No data
6.	Reported total heat demand, Gcal/h	361
7.	Annual heat supply by DH company, Gcal/yr	791,454
	Including: heat purchase from outside, Gcal/yr	No data
8.	Fuel purchase by DH: Natural gas, '000 m <sup>3</sup>	N/A
	Liquid oil, ton	N/A
9.	Fuel cost: Gas, \$US/'000 m <sup>3</sup>	N/A
	Oil, \$US/ton	N/A

## Project proposals of the city

The city's proposals are based on a feasibility study developed by a local company. In general the DHC and the municipality are willing to drastically improve the economics of the heating system, keeping in mind that state subsidies for residential heating would be removed eventually.

Proposed energy efficiency measures include the following:

- Modernization of CHSS with replacement of heat exchangers for space heating, and installation of controls and automatics;
- Moving preparation of DHW from the CHSS to consumers' sites,
- Introduction of individual heating substations (IHSS) within apartment buildings, equipped with controls.

In general, these proposals certainly should be approved, since energy savings associated with such measures were already verified at many sites. Our next step would be a selection of most urgent and/or most beneficial sites for the implementation of these measures within the large municipal heating system.

## *Piatra Neamt*

This medium-size city appears to be in a good physical and economic shape. Unemployment rate is below the average for Romania. There are several major employers: a chemical plant “Sovinesti”, another privatized chemical plant with the participation of the Italian company “Rifil”, a private factory producing synthetic fibers, an agricultural machine building plant with some interest held by FIAT and wood processing industries employing about 4,000 people. There is a very active private tourism business in the area with significant real estate (up to 80% of tourists are foreigners). The municipality considers the local economy to be stable or growing.

Population	124,850
Unemployment rate	9.6%
Local economic outlook	Very good
Commitment of the municipality	Excellent
<b>Affordable debt financing</b>	<b>\$3,500,000</b>

## **Municipality**

Municipal leadership in Piatra Neamt is very active and in full charge of the city development. The mayor and financial managers are quite knowledgeable about different ways to fund and develop projects; not reluctant to discuss less traditional, more creative approaches; and have significant experience in working with foreign partners, particularly northern European, with whom they implemented a number of grants. Their answers to our questions were direct and accurate and their commitment to cooperation was clear (they promptly provided us with all the information asked).

	<b>31-Dec 1999</b>	<b>31-Dec 2000 (plan)</b>
Budget size	\$5,378,471	\$10,150,815
Budget per capita	\$43	\$81
Budget Surplus	\$104,325	\$0
Subsidies as % of budget	11.1%	11.4%

Nevertheless, the financial state of the municipality is far from ideal. The municipality's expectations for the 2000 budget look too optimistic. In 1999 the budget per capita was 14% less than the average for the ten cities under consideration. Subsidies were 11.1%, while the average level for this indicator was 7.1%. However, the budget surplus was on the average level of 1.9%.

## District Heating Company

The municipal enterprise, SC Aqua Calor S.A., is in charge of operation of the municipal heating system, as well as the water supply and sewage system (district heating represents 60-70% of its revenues). This is a commercial (joint-stock) company that is 100% municipally-owned. The company does not have a Board of Directors – instead it is run by an administrator who is appointed by the municipality. Boiler houses, district heating networks and other infrastructure belong to the company.

Cost of heat production	
Gas, ROL/Gcal	428,400
CLU III, ROL/Gcal	981,750
CLU M, ROL/Gcal	1,100,000
Number of employees	No data
Commitment of the DHC	Very good

The growth of the profit margin in 2000 and increase of the current ratio, which was 1.25 on June 31, 2000 show a promising trend in the company's financial performance. However, it is necessary to note that during first six months of 2000 receivables increased by 35% and 20% in ROL and US\$ equivalent, respectively. The current liabilities include outstanding principal in the amount of ROL 17,900 million. According to the payment schedule of this short-term loan, ROL 4,000 million were due on December 31, ROL 9,900 million are due on January 31 and 4,000 million are due on May 31, 2001. The security package includes buildings and guarantees provided by the City Council.

	31-Dec 1998	31-Dec 1999	30-Jun 2000
Operating revenues from heating activity excluding subsidies	\$3,857,508	\$3,413,453	No data
Operating revenues from heating activity including subsidies	\$4,522,136	\$4,418,518	No data
Total revenues	\$7,693,930	\$6,561,013	\$3,783,688
Profit margin	0.7%	0.6%	3.7%
Current ratio	0.99	1.13	1.25

The municipal heating system in the city consists of 67 isolated systems, each of them fed by its own boiler house (BH). Only a small number of these systems are interconnected. These systems serve about 91% of the population.

Apparently the state of the municipal heating system is better than at other visited cities. District heating (DH) management considers that the efficiency of each BH is between 60 and 90 %; as for the network it is presumably in the range of 70 – 90 %. The age of equipment and pipes varies between 10 and 40 years, thus it's mostly worn-out and in a need for replacement. A few

BHs are already upgraded with new equipment. Also with local financing some sections of networks had been repaired and replaced. As many other cities, this one receives state subsidies for space heating. Anticipating future removal of these subsidies the municipality is willing to improve the efficiency and replace some aged equipment and networks.

1.	Served by DH, '000 residents	114
2.	Duration of heating season	180
3.	Average temperature of heating season, °C	No data
4.	Total heated floor area, m <sup>2</sup>	1,900,129
5.	Total installed capacity of heat sources, Gcal/h	333
6.	Reported total heat demand, Gcal/h	No data
7.	Annual heat supply by DH company, Gcal/yr	419,089
	Including: heat purchase from outside, Gcal/yr	N/A
8.	Fuel purchase by DH: Natural gas, '000 m <sup>3</sup>	80%
	Liquid oil, ton	20%
9.	Fuel cost: Gas, \$US/'000 m <sup>3</sup>	62
	Oil, \$US/ton	No data

## Project proposals of the city

Initial proposals from the city were based on pre-feasibility study developed by the German firm MVV Mannheim in 1998. The following alternatives were evaluated in the study:

- Upgrade of existing BHs,
- Installation of small boilers for each building,
- Installation of 6 small CHP plants instead of 6 existing BHs.

The first alternative was selected as the least-cost solution. It assumes the implementation of the wide range of energy efficient measures for the heating system, namely:

- Upgrade of BHs,
- Upgrade and replacement of 88 km of heating network,
- Installation of individual heating substations (IHSSs) inside apartment buildings,
- Upgrade of internal networks inside apartment buildings, including installation of thermostatic valves for each radiator,
- Installation of SCADA system.

The total project cost was around \$ US 63 million, and estimated heat savings were approximately 30 %.

After discussions with the DHC it was agreed that a completion of the modernization of 9 boiler houses (BH #1, 2, 3, 4, 5, 6, 12, 41, 53) with the replacement of all existing equipment should be considered a priority. Recently the DHC repaired networks connected to these BHs, and now these networks are in good conditions. In order to eliminate the problem with domestic hot water (DHW) piping corrosion at these networks, it is proposed to establish DHW preparation inside buildings. Most essential benefits from the proposed project include high potential for

replication and step-by-step implementation requiring small upfront investments. In the long-term prospective the municipality hopes eventually to modernize all BHs and heating networks.



## ***Tulcea***

Tulcea is a medium-sized city with clearly industrial profile. The most important industries for its economy are the following: aluminum plant, now owned by the firm “BBG Alum” from UK; chemical plant “Plastex”; two shipyards, including one that is owned by a Norwegian firm; textile factory; number of food processing facilities, owned by the firms from Spain and Italy. City has an airport, two industrial and one passenger harbors on the Danube river. Production at most of these enterprises is expected to grow, but general unemployment number for the city is on an average level.

Population	98,320
Unemployment rate	12%
Local economic outlook	Very good
Commitment of the municipality	Very good
<b>Affordable debt financing</b>	<b>\$2,500,000</b>

## **Municipality**

If at the end of 1999 budget indicators were worse than average ratios, on October 31, 2000 they were substantially better. The revenues exceeded the 1999 revenues in US\$ equivalent and the budget surplus was 16% higher, although subsidies were only 1.3%.

	<b>31-Dec 1999</b>	<b>31-Oct 2000</b>
Budget size	\$4,523,775	\$5,241,431
Budget per capita	\$46	\$53
Budget surplus	0.4%	16.3%
Subsidies as % of budget	7.5%	1.3%

## **DHC**

The municipal district heating company ACET, which is also in charge of water supply and sewage services, is a joint stock company whose managing director is appointed by the local council.

Cost of heat production, ROL/Gcal	586,550
Cost of heat distribution, ROL/Gcal	133,450
Number of employees	284 (323 in the previous year)
Commitment of the DHC	Very good

The company's financial indicators are disturbing. The profit margin dropped from 2% on December 31, 1998 to -5% at the end of 1999, and then to - 8% on June 30, 2000, which reflected continuous increase of losses in 1999-2000. In addition, the current ratio being as low as 1 decreased from 0.99 on December 31, 1998 to 0.91 on June 30, 2000. The heat tariff is very high, and subsidies comprise almost half of heat revenues. Furthermore, population has problems paying for heat even at the level of NRP (according to the statement of DHC management, an average delay in payments from population is 12 months).

	<b>31-Dec 1998</b>	<b>31-Dec 1999</b>	<b>30-Sep 2000</b>
Operating revenues from heating activity excluding subsidies	\$932,542	\$602,480	No data
Operating revenues from heating activity including subsidies	\$2,087,723	\$1,028,594	No data
Total revenues	\$4,131,173	\$2,314,851	\$1,428,784
Profit margin	2.0%	-5.0%	-7.9%
Current ratio	0.99	0.97	0.91

Arrangements for the heat supply are rather complicated at Tulcea. The municipal heating company ACAET doesn't have own heat sources and purchases heat from two BHs, which belong to the chemical plant and "BBG Alum". These BHs are located in 3 km from city's border and supply heat via heating transmission pipelines. Flow meters and thermometers are installed next to the gates of mentioned enterprises.

CHSSs and secondary networks belong to the municipality. In the past, up to 15,000 apartments were served by DH systems. By this time about 3,000 households decided to be disconnected from these systems by various reasons (low quality of supply, high cost of services, frequent interruption of DHW supply, etc.).

Since the DH infrastructure has deteriorated, the municipality decided to install local heat supply sources and to terminate heat purchase from industrial BHs. In order to achieve this goal the program for conversion of CHSSs into local BHs was initiated. A French company "Monteney Dalkia" made investments into conversion of CHSSs to local BHs, and in return obtained a concession for operation of new 15 local systems up to the time when the investment would be returned.

Although households connected to these new systems have a reliable heat supply, such actions don't look as a sound solution from the financial point of view. As a matter of fact old inefficient industrial BHs utilizing expensive heavy liquid fuel sell heat at ROL 700,000 (\$US28) per 1 Gcal. New local boilers use even more expensive light fuel, and their tariff is ROL 850,000 (\$US34) per 1 Gcal.

In addition, the situation with heat supply for households, which still are connected to the systems delivering heat from industrial BHs, became even worse. Even before the disconnection of a large number of users, equipment at industrial BHs was oversized. After the reduction of

the residential load the situation turned out to be worse, especially in summer time, since at a low load it became technically impossible to have any supply. The Electrotek team was informed that these households haven't had DHW supply for two years. Due to low quality of services during heating seasons they were forced to use even more expensive electricity to heat their dwellings. Furthermore, there is no natural gas network in the city; for cooking the population uses LPG. Thus, expenses for energy purchase (electricity, LPG, space heating) consume most of the residents' income.

1.	Served by DH, '000 residents	No data
2.	Duration of heating season	190
3.	Average temperature of heating season, °C	-1
4.	Total heated floor area, m <sup>2</sup>	880,764
5.	Total installed capacity of heat sources, Gcal/h	No data
6.	Reported total heat demand, Gcal/h	87.2
7.	Annual heat supply by DH company, Gcal/yr	359,190
	Including: heat purchase from outside, Gcal/yr	No data
8.	Fuel purchase by DH: Natural gas, '000 m <sup>3</sup>	None
	Liquid oil, ton	None
9.	Fuel cost: Gas, \$US/'000 m <sup>3</sup>	N/A
	Oil, \$US/ton	N/A

## Project proposals of the city

In general, there are two alternatives for a future municipal heating system development:

- Continuation of purchasing heat from external source (mainly, BBG Alum), and upgrading of CHSSs and the secondary network in order to improve the efficiency,
- Transformation of municipal DHC from a heat re-seller to a heat generator. Under this alternative local BHs are to be constructed where CHSSs are located now.

Each alternative presents its own pros and cons.

The city hopes to get access to natural gas. Gas transmission pipelines are located in 17 km from the city. Currently natural gas is the cheapest fuel at most regions of Romania, and even with anticipated price increase this trend would prevail in a future.

It is clear that establishing the gas network in the city would drastically improve the situation under any scenario of the future development. Under the first scenario, with heat generated on the base of natural gas at industrial BHs their tariffs would go down. The same would happen in the other scenario, when the municipal DHCs start their own heat generation utilizing natural gas.

Utilization of natural gas for cooking (instead of more expensive LPG) provides essential benefits for inhabitants. The next benefit for population would be abandoning electricity use for space heating. It will change for the better solvency of the population, and finally the

municipality will be able to improve the cash collection from the residential sector for communal services.

A construction of BH next to the existing booster pumping station looks like a promising alternative for the heating system rehabilitation. Under all circumstances it would be a move in the right direction. In case of the continuation of heat purchasing from industries, it would provide DHW supply for the city in the summer time. In case of own generation it would serve as a central BH.

An essential issue, which makes this city a good candidate for the bankable project development, is a potential for high economic return, due to an accumulated effect of switching to a cheaper fuel and improvement of the energy efficiency.

## *Campina*

This small city has four major enterprises: oil refinery, machine building plant, metallurgical complex, and automobile repair facility. Some of them get to export their product, and reported unemployment numbers are quite low. But the general impression of the outlook in the city was just average, and since municipality did not provide specific numbers on economic activities of major employers, it is difficult to make a definite judgement on the city perspectives.

Population	42,000
Unemployment rate	8%
Local economic outlook	Good
Commitment of the municipality	Good
<b>Affordable debt financing</b>	<b>\$1,500,000</b>

## **Municipality**

Although budget indicators for 1999 look good as compared with other cities, estimates for 2000 are not promising. In 2000 the municipality expected a decrease of tax revenues in local currency, and growth of subsidies from 1% to 39%. Moreover, even with such a level of subsidies, the municipality expected 6% of the budget deficit.

	<b>31-Dec 1999</b>	<b>31-Dec 2000 (plan)</b>
Budget size	\$2,620,733	\$2,846,899
Budget per capita	\$62	\$68
Budget surplus	0.0%	-5.9%
Subsidies as % of budget	1.0%	39.3%

## **DHC**

Compania Publica de Gospodarie is in charge not only for heat, but also for water supply and sewage (about 40% of its total revenues is from heat sales). It is a joint stock company that is owned by the municipality. They do not have Board of Directors, and the General Manager is appointed by the Mayor and signs 4-year contract (last time approved December 22, 1999). The district heating infrastructure belongs to the municipality, and Compania Publica de Gospodarie operates it under the concession.

Cost of heat production, ROL/Gcal	No data
Cost of heat distribution, ROL/Gcal	No data
Number of employees	273
Commitment of the DHC	Good

Despite of some deterioration of the financial performance in 1999, company's indicators look more promising on June 30, 2000. The current ratio increased from 1.11 on December 31, 1999 to 1.27 at the end of June 2000, and the profit margin reached 5.8%. The company has a credit line at the Treasury to increase the working capital. The outstanding principal is ROL 150 million.

	<b>31-Dec 1998</b>	<b>31-Dec 1999</b>	<b>30-Jun 2000</b>
Operating revenues from heating activity excluding subsidies	\$656,504	\$561,752	No data
Operating revenues from heating activity including subsidies	\$797,353	\$652,757	No data
Total revenues	\$2,259,425	\$1,660,037	\$1,207,604
Profit margin	2.1%	-0.8%	5.8%
Current ratio	1.20	1.11	1.27

In the past the refinery provided heat to the municipal network. After privatization of the refinery the heat supply to the municipal DHS was terminated. Presumably it became not profitable for the enterprise from the commercial point of view. Following this action, the municipality was forced to install own boilers in the order to meet unmet residential demand. These installations had been made inside 12 CHSS buildings.

Thus, presently the municipal heating system consists of twelve independent local networks, and each of these is fed from the local BH. Only three networks are interconnected allowing to run only one BH for domestic hot water supply for all three systems during non-heating season. All municipal boiler houses utilize natural gas (except BH # 1 utilizing liquid fuel). No chemical treatment applied for raw water before it becomes heated in boilers. Special heat exchangers for preparing domestic hot water from tap water are installed within BHs.

The local personal is aware that the heating system operates non-efficiently, mainly by comparing the readings of gas meters and heat meters installed at BHs. The cost of production of heat unit (1 Gcal) is extremely high. They didn't test boiler efficiency, but thinking it was about 40% only. The second major problem is an internal corrosion of boilers' tubes, which inevitably should take place due to the absence of chemical water treatment.

1.	Served by DH, '000 residents	20
2.	Duration of heating season	165
3.	Average temperature of heating season, °C	No data
4.	Total heated floor area, m <sup>2</sup>	No data
5.	Total installed capacity of heat sources, Gcal/h	56
6.	Reported total heat demand, Gcal/h	No data
7.	Annual heat supply by DH company, Gcal/yr	No data
	Including: heat purchase from outside, Gcal/yr	N/A
8.	Fuel purchase by DH: Natural gas, '000 m <sup>3</sup>	No data
	Liquid oil, ton	No data
9.	Fuel cost: Gas, \$US/'000 m <sup>3</sup>	No data
	Oil, \$US/ton	No data

## Project proposals of the city

In order to reduce expenses and improve operational efficiency the municipality and DHC proposed complete upgrade of the oldest BHs # 1 and 2 together with appropriate networks. Heat exchangers separating primary and secondary networks were proposed for installation inside BHs. Heat exchangers for DHW preparation are supposed to be moved into buildings. In long-term perspective the municipality plans to rehabilitate all BHs and heating networks.

## *Alba Iulia*

The economic outlook for this medium-size city is slightly better than average. There is a number of large and small enterprises in the city (numerous porcelain industries, several local and foreign shoe factories). There are Italian investments in an electronics factory, in textile industry. A local greenhouse was bought by Italians. In 1999 an Italian consortium “Frati” invested in a \$150 M green field project – the largest factory in Romania for wooden fiber and finishing elements for furniture industry. The economy, according to municipality representatives, is picking up. Unemployment rate is below national figure.

Population	75,000
Unemployment rate	9%
Local economic outlook	Good
Commitment of the municipality	Very good
<b>Affordable debt financing</b>	<b>\$2,000,000</b>

## **Municipality**

On December 31, 1999 the budget per capita exceeded the average by 9%, and the subsidies were approximately on the average level. After nine months of 2000 the municipality collected 93% of the planned revenues with only 4.2% of subsidies, and the budget surplus reached 7.7%.

	<b>31-Dec 1999</b>	<b>30-Sep 2000</b>
Budget size	\$4,033,324	\$2,965,690
Budget per capita	\$54	\$40
Budget surplus	0.4%	7.7%
Subsidies as % of budget	8.2%	4.2%

## **DHC**

There are two companies in the city providing district heat to consumers.

1. The municipality have concessioned the operation of the whole DH system to a privately owned company SC Dalkia (Joint-Venture SC Dalkia, with the share of French capital). The concession agreement is from 01.01.1992 for 20 years.
2. About 1000 apartments (3000 residents) are supplied with heat by SC Apa Canal SA Alba Iulia - a 100% municipally owned water and sewerage utility company. Since 1999 they started operating 4 BH and supplying heat to a small part of the city.



Since SC Apa Canal SA Alba Iulia presented only the part of the requested financial information, and in addition presented data looks inconsistent, it is rather difficult to make any conclusions about the financial performance. The company came to the end of 1999 with very big losses, and the profit margin was estimated at -14%.

	31-Dec 1999
Operating revenues excluding subsidies	\$121,340
Total operating revenues including subsidies	\$147,718
Profit margin	-14.3%

The only heating source for the municipal DHS is a former industrial BH, fueled by natural gas and equipped with 2 steam boilers of 30 t/h each. No industrial load exists anymore, thus only one boiler is needed for an operation. At BH heat from steam is transferred to hot water of primary heating loop via two steam-to-water plate heat exchangers. In its own turn hot water of primary heating loop transfers heat to hot water of secondary heating loop and to domestic hot water via heat exchangers located within 4 central heating substations. All equipment of the heating system is old, worn-out, and inefficient (with the exception of recently installed plate heat exchangers). The heating network is also worn-out and thermal insulation is damaged or missed, which leads to extremely high heat and water losses.

1.	Served by municipal DH, '000 residents	3.0
2.	Duration of heating season	180
3.	Average temperature of heating season, °C	No data
4.	Total heated floor area, m <sup>2</sup>	79,354
5.	Total installed capacity of heat sources, Gcal/h	55
6.	Reported total heat demand, Gcal/h	11
7.	Annual heat supply by DH company, Gcal/yr	9768
	Including: heat purchase from outside, Gcal/yr	None
8.	Fuel purchase by DH: Natural gas, '000 m <sup>3</sup>	588
	Liquid oil, ton	None
9.	Fuel cost: Gas, \$US/'000 m <sup>3</sup>	50
	Oil, \$US/ton	N/A

## Project proposals of the city

The feasibility study, which was developed in 1995 for heating system operated by “Apa-Canal”, includes the following proposals:

- Replacement of 4 CHSSs with local boiler houses,
- Separation of the system into 4 local thermal zones with installation in each zone of a small local BH, practically without distribution networks. According to this alternative, 70 small BHs should be installed totally.

The total cost of either alternative was in the range of \$ 3 million, which can't be justified. Only 3000 residents are served by the municipal DHC, and anticipated savings will be limited.

After the discussions with the Electrotek team, the municipality and DHC proposed decentralization of heat supply by substituting an existing steam BH with 4 smaller BHs in place of 4 CHSSs. Besides of the improvement of the heat generation efficiency the target of the proposals is to eliminate up to 4 km of primary network.

The other alternative that should be checked as least-cost solution is replacement of the existing oversized steam boiler with heat-only-boilers. At the same time existing a BH building and chimney might be used, as well as all gas and water connections and cables.

Implementation of any of these two alternatives presents high potential for replication and step-by-step implementation requiring relatively small initial investment.

## ***Targoviste***

A medium-size city in a very typical situation – diverse but not vibrant economy, significant share of the subsidies in the municipal budget, problems with non-payments from population and late payments from the state budget, average unemployment rate.

Population	100,000
Unemployment rate	between 9% and 13%
Local economic outlook	Good
Commitment of the municipality	Good
<b>Affordable debt financing</b>	<b>\$4,000,000</b>

## **Municipality**

Although in 1999 the budget per capita was 9% higher than the average, subsidies were twice the average and reached 16.3%. Despite reported surpluses, municipality had troubles paying its bills due to its dependency on state subsidies (last year they got only half of expected subsidies for heat and, as result, defaulted in their payments for fuel for schools). There is also a water project for which they have guaranteed a part of the loan. The analysis of the 1999 budget led to the initial conclusion that estimated budget for 2000 was too optimistic.

	<b>31-Dec 1999</b>	<b>31-Dec 2000 (plan)</b>
Budget size	\$5,378,475	\$10,150,815
Budget per capita	\$54	\$102
Budget surplus	1.9%	0.0%
Subsidies as % of budget	16.3%	11.4%

## **DHC**

Targoviste's district heating company SC Termica SA is 100% municipally owned entity (commercial society) that operates DH system under the concession agreement.

Termica general manager has a 4-yr contract with the Board of Directors signed in 1998. All the members of the Board of Directors are members of the city council.

Cost of heat production	
ROL/Gcal	488,250
ROL/Gcal	354,500
Cost of heat distribution, ROL/Gcal	123,800
Number of employees	450
Commitment of the DHC	Fair

According to 1999 financial statements presented by the management, the company financial performance deteriorated. The company had losses, and the current ratio dropped from 1.08 to 0.41. After first six months of 2000 the company did not have losses, but the current ratio was on the same level.

	31-Dec 1998	31-Dec 1999	30-Jun 2000
Operating revenues from heating activity excluding subsidies	\$1,358,284	\$2,505,935	No data
Operating revenues from heating activity including subsidies	\$1,361,935	\$3,547,349	No data
Total revenues	\$1,362,665	\$3,829,755	\$1,838,230
Profit margin	3.5%	-4.6%	0.4%
Current ratio	1.08	0.41	0.43

The development of the municipal heating system started in sixties with construction of six local systems, each of them fed by own BH. Heat capacity of each BH varies between 14 MW and 20 MW. During eighties the central district heating system was created and connected to the large industrial BH located within the city. Later the system was connected to the heat network originating from the CHP plant Doicesti, which is located in 11 km from the city's border. It was initially built as a strictly condensing facility for power generation only, and in 1980 the plant was converted into CHP. At that time the plant was already rather aged, as its first stage was commissioned in 1952. The second and third (last) CHP stages were commissioned in 1978 and 1982, respectively. The CHP plan is coal fired, all the rest BHs use natural gas.

The CHP plant supplies heat to the municipal DHS via the transmission pipeline, starting from 2x800mm diameter. In addition to 11 km of pipes, which belong to the CHP plan, between the plant and the city, there are 4 km of the underground transmission pipeline within the city, which are owned by the municipality. Twenty-nine central heating substations are connected to the transmission pipeline.

The CHP plant is owned by "Termoelectrika". Two years ago the ownership of the central boiler house was transferred to the municipality, as city's industries didn't need it anymore. Six local BHs from the very beginning were municipally owned.

The main concern of the municipal government and management of the DHC is a future performance of the united DHS. According to the presented information total maximum load in

winter on two DH sources is 140 MW (121 Gcal/h). The central BH provides 45 MW only, and the CHP plant generates 95 MW. During non-heating season when only DHW demand exists, the central BH meets that demand, and the CHP plant doesn't supply any heat.

Since the central BH was initially designed for industrial purposes, some of its equipment was not quite applicable for DH use. Out of 12 installed boilers only 3 are heat-only (water) ones, and other 9 were designed for generation of steam for industrial needs (up to 15 bar in pressure).

1.	Served by DH, '000 residents	70
2.	Duration of heating season	150
3.	Average temperature of heating season, °C	No data
4.	Total heated floor area, m <sup>2</sup>	No data
5.	Total installed capacity of heat sources, Gcal/h	No data
6.	Reported total heat demand, Gcal/h	No data
7.	Annual heat supply by DH company, Gcal/yr	No data
	Including: heat purchase from outside, Gcal/yr	No data
8.	Fuel purchase by DH: Natural gas, '000 m <sup>3</sup>	No data
	Liquid oil, ton	No data
9.	Fuel cost: Gas, \$US/'000 m <sup>3</sup>	No data
	Oil, \$US/ton	No data

## Project proposals of the city

The following energy saving measures were proposed:

- At generation side within central BH:
  - Upgrade of 3 heat-only (water) boilers in order to improve efficiency,
  - Upgrade of 4 steam boilers in order to improve efficiency with installation of steam-to-water heat exchangers and controls,
- At transmission and distribution network:
  - Upgrade of primary and secondary networks, and installation of heat meters at CHSS,
- At demand side:
  - Installation of heat meters at a number of apartment buildings.

During the meeting in this city the Electrotek team stressed that proposed investments in the amount of \$ 36.0 million exceeded the borrowing ability of the municipal budget about 10 times. The team suggested to consider most urgent measures with high return on investment.

The second comment was that even with all equipment of the central BH aged and worn-out, at present the available heat capacity significantly exceeds the demand. Proposed by the city energy efficiency improvements at supply side (the central BH) would increase the capacity even more. At the same time proposed investments in transmission and distribution systems lead to reduction of a heating load. Thus, the obvious recommendation was to reduce the investments in

the central BH and target focus only on the upgrade of equipment, that will be in operation in the future.

Then, the municipality and DHC proposed to install heat meters for all CHSSs, and in addition for some apartment buildings connected to mentioned CHSSs. Taking into account that heat meters already exist at the central BH, this proposal means three stage of heat metering. Furthermore, heat meters at the demand side without any controls (as it was proposed) don't provide any energy savings. The preferable solution is to leave at CHSSs only the valves for distribution networks connections, and relocate the metering (together with controls) to new individual heating substations in buildings.

Finally, during the meeting in the city it was revealed that the existing gas supply pipeline is not sufficient to support a future heat generation, and construction of 6 km of a new pipeline is needed. In this case investment into the second pipeline should be included into the final proposal.

Although there is good potential for energy savings in the city, the selection of specific measures still requires additional analysis.

## *Slobozia*

The city was developed around the chemical plant “Amonil” that produces fertilizers (the source of raw materials is the gas pipeline going from Ukraine). Now the production at “Amonil” has declined (“Amonil” used to have about 4000 employees, now it’s down to 500), and city economic perspective looks bleak.

Population	57,000
Unemployment rate	10%
Local economic outlook	Poor
Commitment of the municipality	Excellent
<b>Affordable debt financing</b>	<b>\$1,500,000</b>

## **Municipality**

The municipality seems to be tightly controlled by the mayor. The local City Council has 23 members but mostly approves the decisions made in the City Hall. The budget indicators for 1999 as well as the forecast for the 2000 budget are approximately on the average level. But the information they provided was inconsistent and included many questionable numbers (i.e., they indicated expected surplus in the year 2000 on the level of 50% and estimated the personal property income taxes to be 11 times higher than in 1999). It is impossible to provide a dependable estimate of the municipality creditworthiness without more transparent financial data.

	<b>31-Dec 1999</b>	<b>31-Dec 2000 (plan)</b>
Budget size	\$2,869,006	\$2,979,429
Budget per capita	\$50	\$52
Budget surplus	No data	No data
Subsidies as % of budget	8.5%	3.3%

## **DHC**

The company Urban SA deals with heat, water supply and sewage (about half of its total revenues is from heat sales). It is a joint stock company that is owned by the municipality; it does not have a Board of Directors and instead is run by the Administrator who gets appointed by the local council and the Mayor. It is the concessionaire of the DHS assets that belong to the municipality.

Cost of heat purchased, ROL/Gcal	
Cost of heat distribution, ROL/Gcal	
Number of employees	476
Commitment of the DHC	Excellent

The current ratio trend is very disturbing. The ratio dropped from 1.28 at the end of 1998 to 0.67 on December 31, 1999 and then to 0.59 on June 30, 2000. At the end of June the current liabilities were two times higher than total revenues. On December 31, 2000 the company had outstanding principal in the amount of ROL 600 million. This credit line had to increase the working capital and was secured by company's vehicles.

	31-Dec 1998	31-Dec 1999	30-Jun 2000
Operating revenues from heating activity excluding subsidies	\$1,587,586	\$1,448,694	No data
Operating revenues from heating activity including subsidies	\$3,676,769	\$3,019,995	No data
Total revenues	\$3,728,617	\$3,139,963	\$1,606,564
Profit margin	1.3%	0.4%	0.5%
Current ratio	1.28	0.67	0.59

The two main heating sources for the city are located at the chemical plant "Amonil", 7 km from the city border: 1) heat recovery installation for cooling process and 2) heat-only boiler. The total heat capacity of these units is 31 Gcal/h, but cooling process is needed in summer time only. Thus, during heating season heat-only-boiler of 16 Gcal/h is available for the municipal heating.

Seven kilometers of the pipeline of 700 mm in the diameter between the chemical plant and city belong to the municipality and are operated by the municipal heating company Urban S.A. Cross section of the pipeline significantly exceeds necessary size, and operational costs and heat losses are high. During the last year approximately \$ 150,000 was spent for pipe re-insulation only.

The program for the installation of local BHs in CHSS buildings is already underway in the city. Now there is a number of small BHs supplying heat to local systems.

16,250 apartments are served by the DHS, and even with full utilization of installed capacity of heating sources the adequate heating could not be provided. About 1% of population, who were able to afford additional investments in order to have more comfort, have installed their own gas-to-water heaters inside apartments. Currently foreign manufacturers of such equipment from Italy, France, Poland, and Hungary are rather active on the Romanian market. Unfortunately, this equipment will likely be destroyed in relatively short time, as no water treatment is applied.



Not only heat sources in the city are not able to meet current demand, but the contract for heat supply between chemical plant and the municipality has already expired. Since the chemical plant has own heat needs, the enterprise is not interesting in renewing the contract.

The second major problem is low efficiency of heat delivery and high operational cost for the network originating at the chemical plant, especially during heating seasons. Currently this facility sells the heat under two different tariffs. The tariff is low for the heat generated from heat recovery installation, but it is available only during non-heating season. The tariff for heat generated at heat-only-boiler the tariffs is significantly higher.

1.	Served by DH, '000 residents	49
2.	Duration of heating season	150
3.	Average temperature of heating season, °C	1.1
4.	Total heated floor area, m <sup>2</sup>	602,208
5.	Total installed capacity of heat sources, Gcal/h	37.4
6.	Reported total heat demand, Gcal/h	49.2
7.	Annual heat supply by DH company, Gcal/yr	186,884
	Including: heat purchase from outside, Gcal/yr	No data
8.	Fuel purchase by DH: Natural gas, '000 m <sup>3</sup>	No data
	Liquid oil, ton	No data
9.	Fuel cost: Gas, \$US/'000 m <sup>3</sup>	No data
	Oil, \$US/ton	No data

## Project proposals of the city

The management of DHC indicated the desire to continue purchase inexpensive heat from heat recovery at the chemical plant. There are different approaches to the future development of the heating system in the city. One approach is to install relatively large BHs for buildings' clusters (up to 8 Gcal/h in heat capacity), and another option is to have small BHs for every one-two buildings (up to 0.6 Gcal/h in heat capacity). Currently both types of such BHs exist in the city, and both show efficient operation.

Due to the remote location of the chemical plant and high annual cost of the transmission pipeline maintenance, it doesn't make sense to purchase heat from the chemical plant. The development of local systems looks more promising.

## Urziceni

Urziceni is the smallest city of all visited. Nevertheless, it has quite diverse and mostly privatized economy, including Magnetic Metal Plant with 450 employees, four textile factories, employing around 1500 workers in total, brick and ceramics factory with 300 employees, furniture factory, plastics factory. There is also a number of large and small food-processing enterprises, such as vegetable oil factory, meat processing enterprise, three alcohol and beverage factories, tobacco factory and a sugar mill. Unemployment rate is reasonably low, and many of the enterprises report a planned increase in employment.

Population	18,800
Unemployment rate	8.2%
Local economic outlook	Very good
Commitment of the municipality	Good
<b>Affordable debt financing</b>	<b>\$500,000</b>

## Municipality

On December 31, 1999 the budget had a significant surplus with a very low level of subsidies during the year (which was a welcome change after two previous years with the state subsidies at about 40% of the budget). However, after nine months of 2000 the municipality collected only 48% of the planned revenues and had a budget deficit of 5.6%.

	<b>31-Dec 1999</b>	<b>30-Sep 2000</b>
Budget size	\$826,702	\$516,510
Budget per capita	\$44	\$27
Budget surplus	8.6%	-5.6%
Subsidies as % of budget	0.1%	3.2%

## DHC

The company SC Terma SA that provides DH services in Urziceni is a municipally owned joint stock company. This company operates water and sewage systems and is in charge for public transportation. Its managing director is appointed by the local council.

Cost of heat production, ROL/Gcal	380,000
Number of employees	173
Commitment of the DHC	Excellent

Although in 1999 the company had big receivables, which were approximately on the level of annual revenues, current assets twice exceeded current liabilities. After first six months the current ratio dropped from 1.94 to 0.45, and the current liabilities were two times higher than company's revenues. Since some statements did not have a consistency (i.e., in 1999 revenues from heat sales plus subsidies exceeded total revenues), any conclusions on the company's financial performance requires additional information and analysis.

	31-Dec 1998	31-Dec 1999	30-Jun 2000
Operating revenues from heating activity excluding subsidies	\$507,166	\$334,213	No data
Operating revenues from heating activity including subsidies	\$565,313	\$379,847	No data
Total revenues	\$1,075,582	\$357,214	\$503,980
Profit margin	2.5%	10.9%	7.6%
Current ratio	3.33	1.94	0.45

The municipally owned company "Terma" is in charge of operation of all BHs and the network, which belong to the municipality. The municipal heating system consists of seven local systems, and each of them fed by its own gas-fired BH. The heat capacity of each BH varies between 4 MW and 8 MW. All seven local BHs use natural gas.

The design of these boilers is rather poor, and in addition some of them are 30 years old. Utilizing their own financial resources the municipality and DHC upgraded two of these BHs with the new equipment. Besides the inefficiency of aged equipment, the second major problem is internal corrosion of boilers' tubes. The third problem is the design of DHW system, i.e. there is only one supply DHW pipe to users, without return. Under these circumstances some untreated water is getting into DHW system, since a makeup water system is not able to replenish all water losses.

1.	Served by DH, '000 residents	12
2.	Duration of heating season	195
3.	Average temperature of heating season, °C	1.8
4.	Total heated floor area, m <sup>2</sup>	182,600
5.	Total installed capacity of heat sources, Gcal/h	44
6.	Reported total heat demand, Gcal/h	60
7.	Annual heat supply by DH company, Gcal/yr	47,000
	Including: heat purchase from outside, Gcal/yr	None
8.	Fuel purchase by DH: Natural gas, '000 m <sup>3</sup>	No data
	Liquid oil, ton	N/A
9.	Fuel cost: Gas, \$US/'000 m <sup>3</sup>	50
	Oil, \$US/ton	N/A

## **Project proposals of the city**

The municipality and DHC initially proposed the following measures:

- At generation side, within local BHs: to replace all old heat-only (water) boilers by new in order to improve their efficiency, to upgrade water-to-water heat exchangers, and to install boilers' controls,
- At distribution network: to replace all networks.

Since the cost of this project significantly exceeds the municipality's ability to secure financing, the most urgent measures were included into the final proposals. The objective of the proposals is to complete rehabilitation of the heating system built around BH #5.

A direct use of the natural gas in buildings might be reviewed as an alternative.

## *Campia Turzii*

This very small town became a municipality not long ago. Its main industry is a big steel-wire plant that provides the whole country with its products. Besides the plant, there are only small service enterprises, many just in the ground-floor apartments of the residential buildings, most state owned. The steel wire plant used to employ 10,000 people in 1990, now it has 5,700 and will have 5,400 employees after full restructuring. Modernization of the plant is a \$100 million project undertaken with German capital (\$20 million are already spent; 70% of the money was provided by the state property fund and 30% by six private banks, investment funds, etc.). The rest \$80 million will be obtained through a company from Magdeburg with the German government guarantees. All of it is a proof, according to the mayor, of the city solid economic future. The transition period in the city is over, he said, now they will begin growing. Unfortunately, not enough signs of this growth are evident yet, and complete dependency of the city on one industry makes it vulnerable to the future economic risks.

Population	30,100
Unemployment rate	10.8%
Local economic outlook	Good
Commitment of the municipality	Good
<b>Affordable debt financing</b>	<b>\$500,000</b>

## **Municipality**

Although the city has the lowest level of the budget per capita in the amount of \$28, other indicators are better than averages. The municipality had a very optimistic forecast for the significant growth of revenues, which should be reached by the increase of subsidies from 5% to 18.4%.

	<b>31-Dec 1999</b>	<b>31-Dec 2000 (plan)</b>
Budget size	\$887,418	\$1,304,110
Budget per capita	\$29	\$43
Budget surplus	3.4%	0.0%
Subsidies as % of budget	5.0%	18.4%

## **DHC**

District heating services, as well as water supply and sewage, are provided in Campia Turzii by Regia Autonome (less than half of total revenues come from the district heating). Before 1991, Regia Autonome was subordinated to the county, then it was transferred to Campia Turzii. Besides this city, they also provide water supply and treatment to an even smaller city of Turda (nearby). Economic decline of 1989 seriously affected the city. Even before they had problems

with the quality of tap water, later it became critical. In 1990-1994 they improved quality of tap water and began modernizing boiler houses. They have major problems with non-payment by both the population and economic entities.

Cost of heat production, ROL/Gcal	351333
Number of employees	No data
Commitment of the DHC	Very good

According to financial statements presented by the management the current ratio improved in 1999 and reached 1.43. Unfortunately, following development was not transparent, since the company did not presented reports reflecting a financial performance in 2000,

	31-Dec 1998	31-Dec 1999
Operating revenues from heating activity excluding subsidies	\$593,336	\$495,911
Operating revenues from heating activity including subsidies	\$638,978	\$548,668
Total revenues	\$1,729,073	\$1,188,024
Profit margin	4.9%	2.0%
Current ratio	0.99	1.43

The municipal DHS consists of 10 isolated systems varying in age. It serves 5185 households or approximately 15,000 residents. Others city residents use local heat sources, such as stoves and gas heaters. Currently all 10 BHs utilize natural gas, including 3 BHs that were coal-fired in the past.

In the beginning of nineties the program for development of municipal heating system was prepared. The municipal budget was primary source for the implementation of this program, with some grants from the national Energy Development Fund. Due to obviously limited financial resources the implementation of the program goes slowly. Nevertheless, following recommendations of the program two local systems were upgraded. The upgrade includes boiler replacement, and the networks rehabilitation with pre-insulated pipes. Unfortunately, nothing was done at the demand side. Upgrade of next three systems is already scheduled, and it should be fulfilled as soon as funds become available.

It is worthwhile to mention that in addition to traditional replacement of worn-out equipment and pipes, the municipality and DHC made some optimization at the network. Some users were reconnected to the closest heat sources. Then the capacity of new boilers were reduced against the ones being decommissioned, reflecting the reduction of heat losses within the network and other efficiency gains.

Besides obvious inefficiency of old BHs, equipped with notorious “Metallica” boilers, the DHC management admits the following problems:

- Shortage of tap water in the year 1999 that influenced operation of the heating system (primary DHW preparation),
- Flooding of connection channels between BHs and buildings, due to high level of underground water and internal leakages from the sewage.

1.	Served by DH, '000 residents	15
2.	Duration of heating season	180
3.	Average temperature of heating season, °C	2
4.	Total heated floor area, m <sup>2</sup>	541,914
5.	Total installed capacity of heat sources, Gcal/h	39.8
6.	Reported total heat demand, Gcal/h	No data
7.	Annual heat supply by DH company, Gcal/yr	62,844
	Including: heat purchase from outside, Gcal/yr	N/A
8.	Fuel purchase by DH: Natural gas, '000 m <sup>3</sup>	9,231
	Liquid oil, ton	N/A
9.	Fuel cost: Gas, \$US/'000 m <sup>3</sup>	50
	Oil, \$US/ton	N/A

## Project proposals of the city

The intention of the city is to upgrade all 10 isolated heating systems including their BHs. Since the cost of the investment program will be approximately \$ 7 million, which is not affordable for the municipality and DHC, it is necessary to select 1-2 systems as a primary target for upgrade.